WHAT IS CLAIMED IS:

1. An organic light emitting device including an emissive layer comprising an organometallic compound comprised of:

a heavy transition metal that produces an efficient phosphorescent emission at room temperature from a mixture of metal-to-ligand charge transfer and π - π^* ligand states;

at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the at least one mono-anionic, bidentate, carbon-coordination ligand is substituted with at least one of an electron donating substituent and an electron withdrawing substituent, wherein the at least one of an electron donating substituent and an electron withdrawing substituent shifts the emission, relative to an un-substituted mono-anionic, bidentate, carbon-coordination ligand, to either the blue, green or red region of the visible spectrum; and

at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the at least one non-mono-anionic, bidentate, carbon-coordination ligand causes the emission to have a well defined vibronic structure.

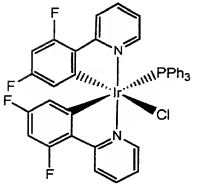
2. The organic light emitting device of claim 1, wherein the heavy transition metal is selected from the group consisting of Os, Ir, Pt and Au.

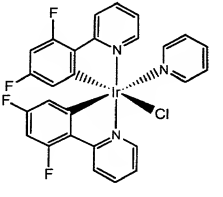
3. An organic light emitting device including an emissive layer comprising an organometallic compound comprised of:

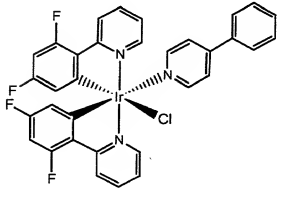
a heavy transition metal;

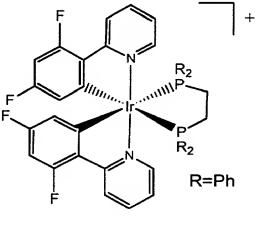
at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal; and

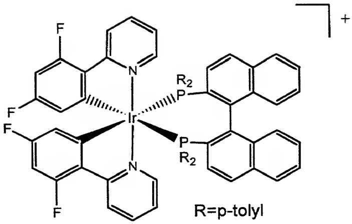
at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the organometallic compound has a chemical structure represented by a formula selected from the group consisting of:

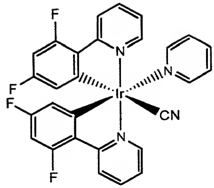


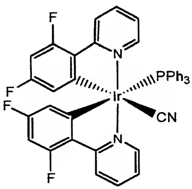


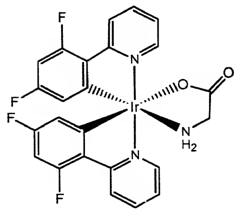


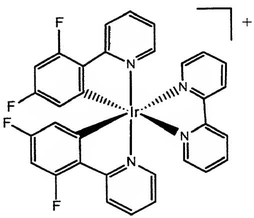


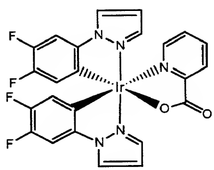

F
R2
P
Ir
F
F
P
R2
F
+
R=p-tolyl

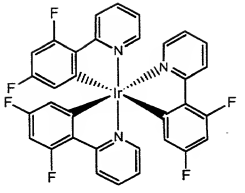

F
N
N
F
Ir
F
CN
N
F

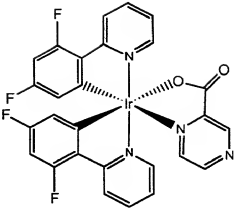

F
N
PPh3
F
Ir
F
CN
N
F

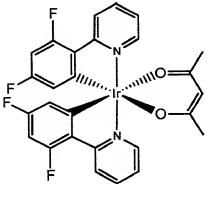

F
N
O
O
F
Ir
F
N
H2
N
F

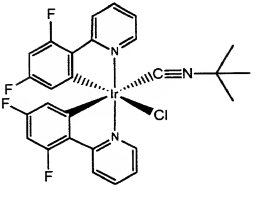

+
F
N
N
F
Ir
F
N
N
F

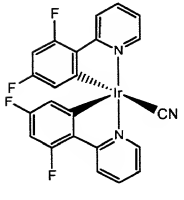

F
N
N
N
F
Ir
F
O
O
F
N
N

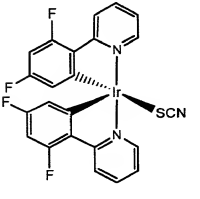


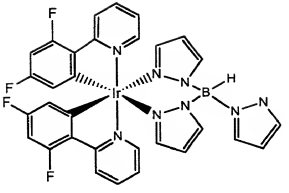


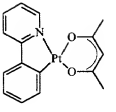


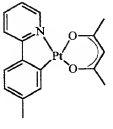


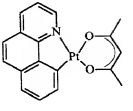


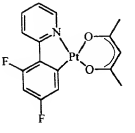


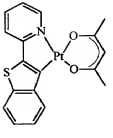


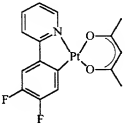












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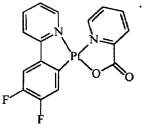
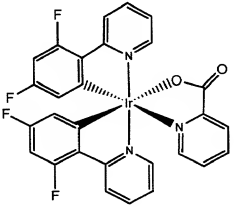


4. An organic light emitting device including an emissive layer comprising an organometallic compound comprised of:

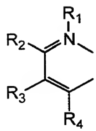
a heavy transition metal;

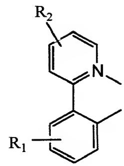
at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal; and

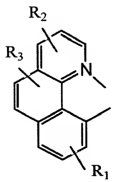
at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the organometallic compound has a chemical structure represented by the following formula:

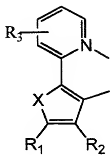


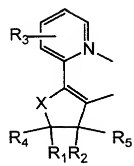
5. The organic light emitting device of claim 1, wherein the at least one mono-anionic, bidentate, carbon-coordination ligand is selected from the group consisting of:

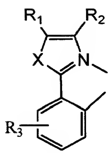

R1
R2
N
R3
R4

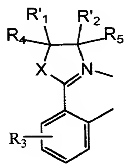

R2
N
R1

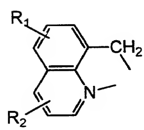

R2
R3
N
R1

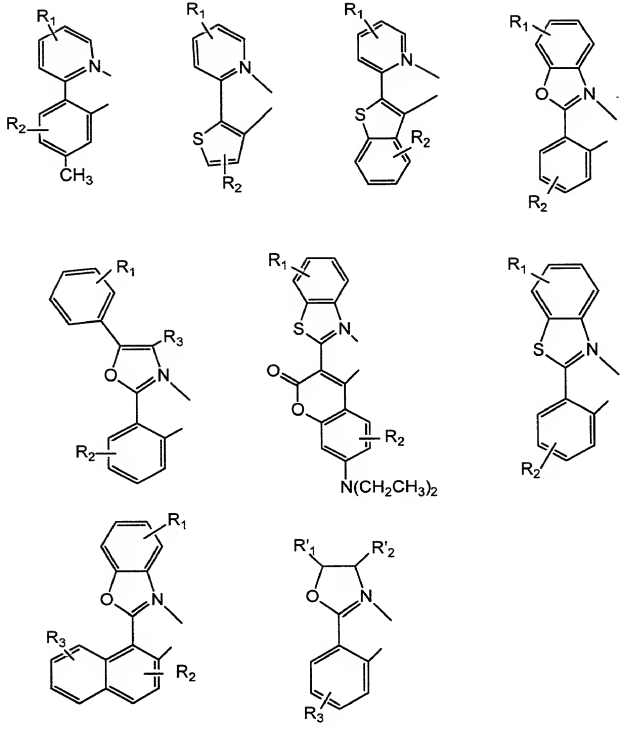

R3
N
X
R1
R2

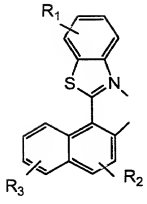

R3
N
X
R4
R1R2
R5

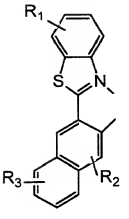

R1
R2
X
N
R3

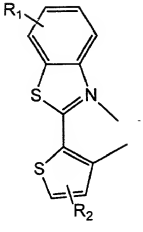

R'1
R'2
R4
R5
X
N
R3


R1
CH2
N
R2









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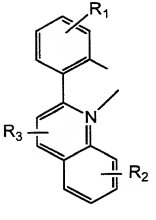
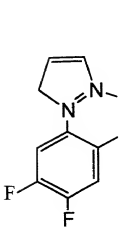
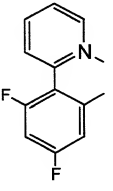
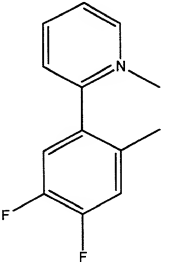


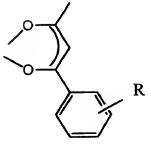
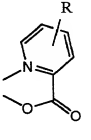
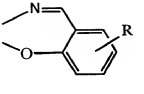
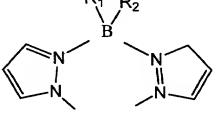
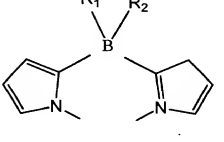
,

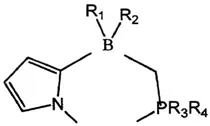
wherein X = S, O, NR; and R_1, R_2, R_3, R_4 and R_5 are, independently, hydrogen, halogen, alkyl, aryl or arylene; and R'_1 and R'_2 may, in combination, be aryl.

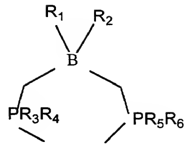
6. The organic light emitting device of claim 1, wherein the at least one mono-anionic, bidentate, carbon-coordination ligand is selected from the group consisting of :

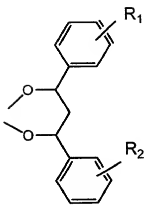


and


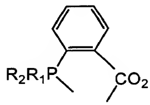
7. The organic light emitting device of claim 1, wherein the at least one non-mono-anionic, bidentate, carbon-coordination ligand is selected from the group consisting of :

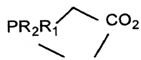







R1 R2
B
N
PR3R4

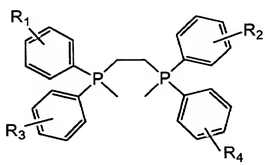

R1 R2
B
PR3R4
PR5R6

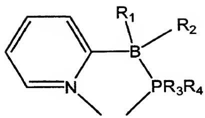

R1
O
O
R2

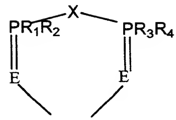

R2R1P
CO2


PR2R1
CO2

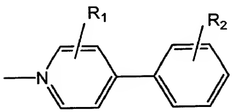

R

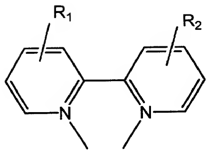

R1
R2
P
P
R3
R4

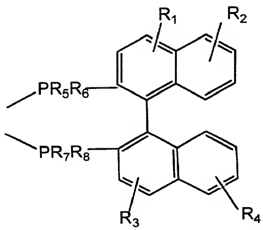


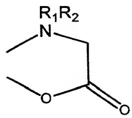


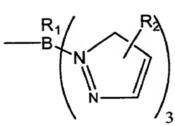
X = CH, N and
E = O, S, Se, Te

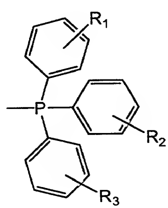












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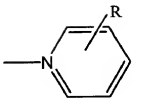
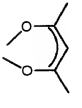
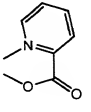
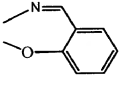


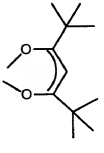
wherein R, R_1, R_2, R_3, R_4, R_5, R_6, R_7 and R_8 are, independently, hydrogen, halogen, alkyl or aryl.

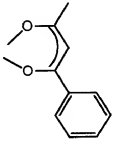
8. The organic light emitting device of claim 1, wherein the at least one non-mono-anionic, bidentate, carbon-coordination ligand is selected from the group consisting of :

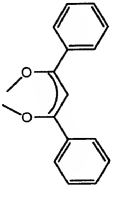


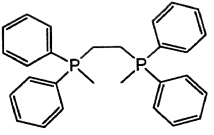


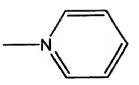


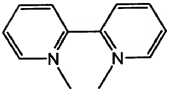


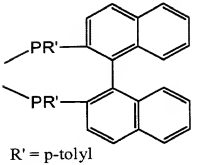




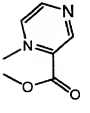


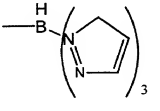


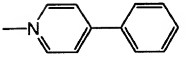


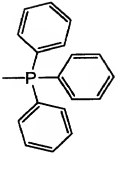


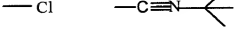
R' = p-tolyl











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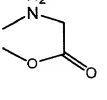
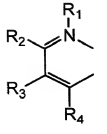


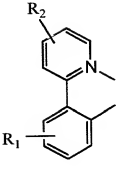
9. An organic light emitting device including an emissive layer comprising an organometallic compound comprised of:

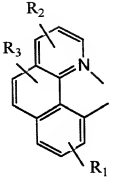
a heavy transition metal selected from the group consisting of Os, Ir, Pt and Au;

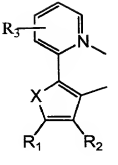
at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the at least one mono-anionic, bidentate, carbon-coordination ligand is selected from the group consisting of :

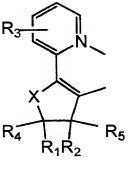
TOP1OT-5548760

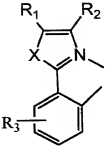


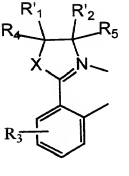


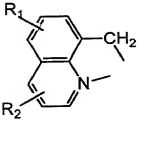


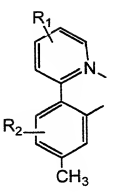
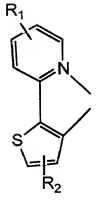
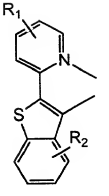
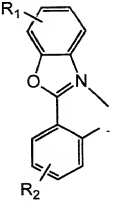
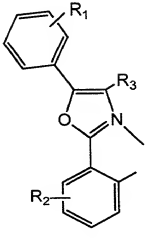
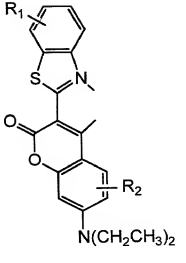
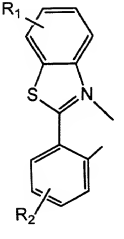
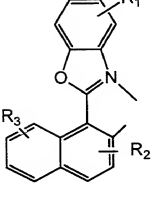
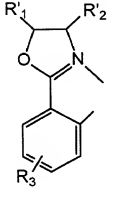




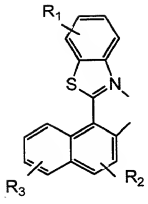
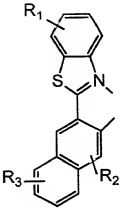
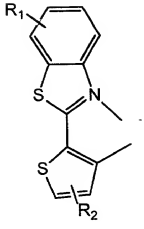






TOSOH 55480660

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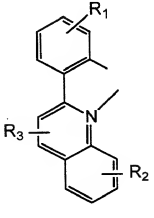
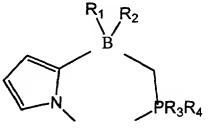
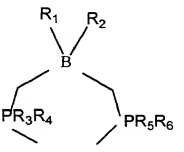


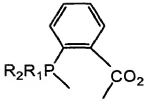
,

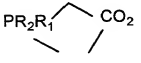
wherein X = S, O, NR; and R_1, R_2, R_3, R_4 and R_5 are, independently, hydrogen, halogen, alkyl, aryl or arylene; and R'_1 and R'_2 may, in combination, be aryl; and

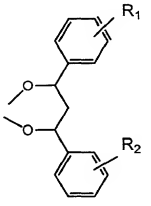
at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the at least one non-mono-anionic, bidentate, carbon-coordination ligand is selected from the group consisting of :

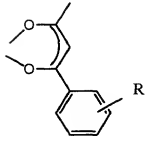


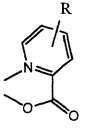


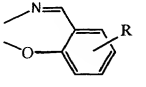


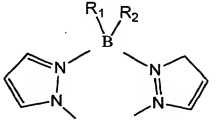


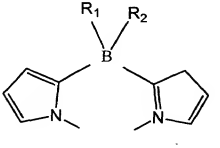


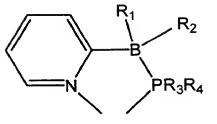


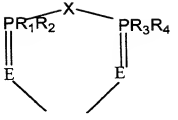




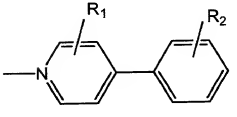


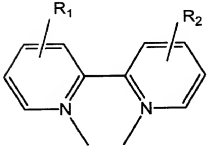


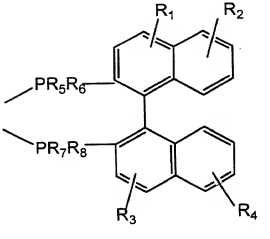


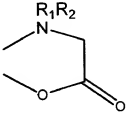


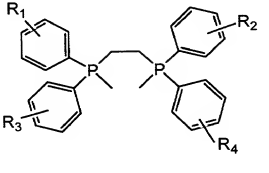
X = CH, N and
E = O, S, Se, Te











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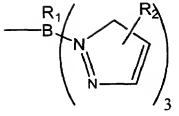

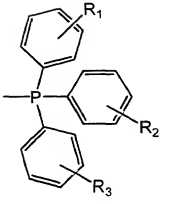

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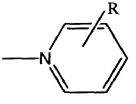


,

wherein R, R_1, R_2, R_3, R_4, R_5, R_6, R_7 and R_8 are, independently, hydrogen, halogen, alkyl or aryl.

10. The organic light emitting device of claim 1, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of

the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

11. The organic light emitting device of claim 2, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

12. The organic light emitting device of claim 3, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

13. The organic light emitting device of claim 4, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

14. The organic light emitting device of claim 5, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

15. The organic light emitting device of claim 6, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

16. The organic light emitting device of claim 7, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

17. The organic light emitting device of claim 8, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

18. The organic light emitting device of claim 9, wherein the emissive layer further comprises:

a host material having a lowest triplet excited state having a first decay rate of less than about 1 per second; wherein the organometallic compound is present as a guest material dispersed in the host material, the organometallic compound having a lowest triplet excited state having a radiative decay rate of greater than about $1x10^5$ per second and wherein the energy level of the lowest triplet excited state of the host material is lower than the energy level of the lowest triplet excited state of the organometallic compound.

19. The organic light emitting device of claim 10, wherein the energy difference between the lowest triplet excited state of the organometallic compound and a

corresponding relaxed stated of the organometallic compound has a corresponding wavelength of about 420 nm to 480 nm for blue light emission.

20. The organic light emitting device of claim 10, wherein the energy difference between the lowest triplet excited state of the organometallic compound and a corresponding relaxed stated of the organometallic compound has a corresponding wavelength of about 480 nm to 510 nm for aqua-blue light emission.

21. The organic light emitting device of claim 10, wherein the host material has a bandgap with an energy difference corresponding to about 470 nm and the organometallic compound has a lowest triplet excited state at an energy level at about 450 nm.

22. The organic light emitting device of claim 10, wherein the host material is an electron transport layer.

23. The organic light emitting device of claim 10, wherein the host material conducts electrons primarily through hole transmission.

24. The organic light emitting device of claim 10, wherein the ratio of the host material and organometallic compound decay rates is at least about 1:1000 to about 5:1000.

25. The organic light emitting device of claim 10, wherein the host material is TPD.

26. The organic light emitting device of claim 10, wherein a plurality of organometallic compounds are dispersed in the host material.

27. An organometallic compound comprising:

a heavy transition metal that produces an efficient phosphorescent emission at room temperature from a mixture of metal-to-ligand charge transfer and π - π^* ligand states;

at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the at least one mono-anionic, bidentate, carbon-coordination ligand is substituted with at least one of an electron donating substituent and an electron withdrawing substituent, wherein the at least one of an electron donating substituent and an electron withdrawing substituent shifts the emission, relative to an un-substituted mono-anionic, bidentate, carbon-coordination ligand, to either the blue, green or red region of the visible spectrum; and

at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the at least one non-mono-anionic, bidentate, carbon-coordination ligand causes the emission to have a well defined vibronic structure.

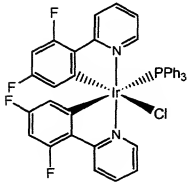
28. The organometallic compound of claim 27, wherein the heavy transition metal is selected from the group consisting of Os, Ir, Pt and Au.

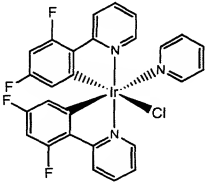
29. An organometallic compound comprising:

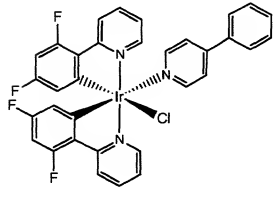
a heavy transition metal;

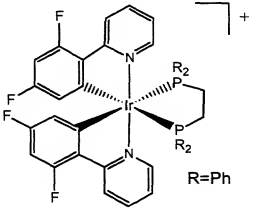
at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal; and

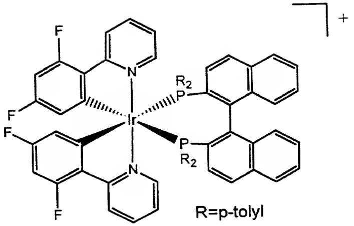
at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the organometallic compound has a chemical structure represented by a formula selected form the group consisting of:











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R2
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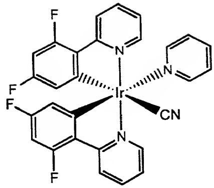
Ir
+

R=p-tolyl



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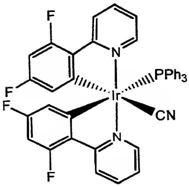

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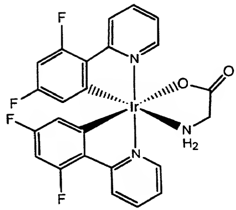

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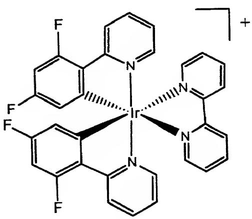

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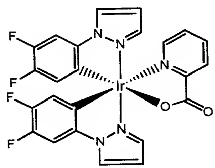

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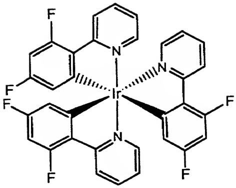

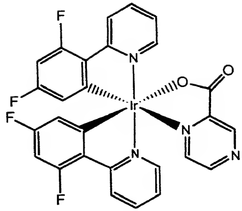

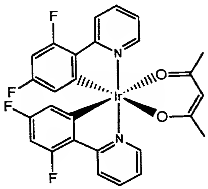

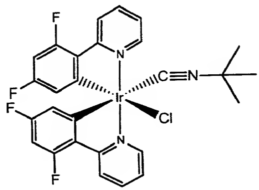

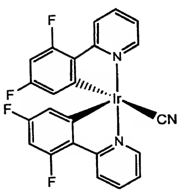

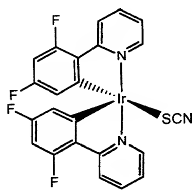

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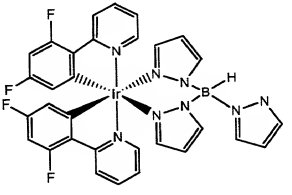

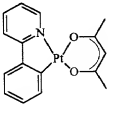

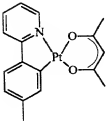

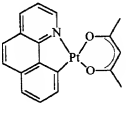

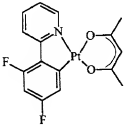

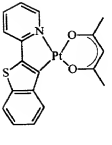

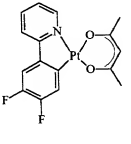

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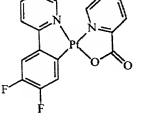

30. An organometallic compound comprising:

a heavy transition metal;

at least one mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal; and

at least one non-mono-anionic, bidentate, carbon-coordination ligand bound to the heavy transition metal, wherein the organometallic compound has a chemical structure represented by the following formula: